Svizzero, Michael

From:	Gerhard, Sasha
Sent:	Thursday, January 23, 2014 1:14 PM
To:	Svizzero, Michael
Subject:	FW: ReCommunity Public Comments on NHSM Rule
Attachments:	P336-EPA M001 RevC Process description for EPA non fuel comfort letter Dec 12.pdf; P336 EPA M002 rev Refinement equipment description 2013_02_13.pdf

Here are two emails: the 3/15/13 and 10/23/12 (at bottom). Both attached files contain CBI – the non-CBI versions are already included in the Entsorga file folder.

Sasha Gerhard
USEPA, Office of Resource Conservation & Recovery
Program Implementation & Information Division, 5303P
703-347-8964 (P)
703-308-0509 (F)

From: Jonathan Birdsong [mailto:jbirdsong@bwstrategies.com]
Sent: Friday, March 15, 2013 9:26 AM
To: Gerhard, Sasha
Cc: Faison, George
Subject: RE: ReCommunity Public Comments on NHSM Rule

Sasha –

Great talking to you yesterday morning. As we discussed, the 8 data points we provided in 2012 for the Slovenia plant are different than the 2011 data. The differences are specific with how the plant was calibrated for each individual user. As discussed in Section 7, starting on page 23 of our December 7, 2012 material submission (attached), because Entsorga can calibrate each facility to meet lower emission standards, we will be able to at least meet the 2011 data referenced. Also, because of the different MSW material in the United States, Entsorga will also be able to both increase calorific value of the SRV while at the same time reduce emissions. Regardless, as we discussed both the 2012 and 2011 sampling data meet the EPA's Legitimacy Criteria.

In addition, pursuant to your questions yesterday re: further detail on the mechanical detail, please let me know if the material submitted in February 2013 is sufficient (also attached). We hope that information, coupled with the proprietary information submitted earlier, will suffice. If not, please let us know.

Thanks and please let me know if you have any further questions.

Sincerely,

Jonathan Birdsong

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From: Gerhard, Sasha [mailto:Gerhard.Sasha@epa.gov]
Sent: Thursday, March 14, 2013 3:49 PM
To: Jonathan Birdsong
Cc: Faison, George
Subject: RE: ReCommunity Public Comments on NHSM Rule

Hi Jonathan,

I did read through most of the attachment and agree that Entsorga has been a bit more detailed with respect to technical information submitted, but I also note that ReCommunty's processing (i.e., more segregation steps and thermal treatment of plastics) is slightly more extensive than Entsorga's. As I mentioned over the phone, the amount of processing required to convert a discarded material (especially MSW, which has its own statutory and regulatory requirements) into a fuel product is being heavily scrutinized. While I don't believe Entsorga's processing is insufficient, I am trying to be proactive in gathering as much information as possible to avoid further delays.

On a similar note, I have reviewed a list of questions developed by our Air office and their legal counsel in regard to a project similar to Entsorga's (I mentioned this over the phone) and just to let you know, I cannot guarantee that a few of the same questions will not be asked of Entsorga.

Also, as soon as I hear from you regarding which data to include, I will finalize the response letter and forward it for review within my office.

Thanks for your patience and understanding.

Sasha Gerhard
USEPA, Office of Conservation & Recovery
Program Implementation & Information Division, 5303P
703-347-8964 (P)
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From: Jonathan Birdsong [mailto:jbirdsong@bwstrategies.com]
Sent: Thursday, March 14, 2013 10:21 AM
To: Gerhard, Sasha
Subject: FW: ReCommunity Public Comments on NHSM Rule

Sasha –

Good talking to you this morning. As I mentioned in our call, this was the example that Entsorga was given to use as a guide (attached). As far as I can tell, Entsorga has been much more specific in its process, has a proven technology that is currently in commercial operation, has local support, and has given several more examples than ReCommunity. Please let me know if I am mistaken. I will get you the answer to your question soon.

Thanks,

Jonathan

From: Thomas.Marc@epamail.epa.gov [mailto:Thomas.Marc@epamail.epa.gov]
Sent: Tuesday, October 23, 2012 3:45 PM
To: Jonathan Birdsong
Subject: ReCommunity Public Comments on NHSM Rule

Hi Jonathan -

It was a pleasure meeting you this afternoon. As promised, please find ReCommunity's public comments on the Dec. 2011 NHSM proposal attached below. These are also available in the rulemaking docket at www.regulations.gov, Docket No. EPA-HQ-RCRA-2008-0329.

(See attached file: ReCommunity Comment - Feb 21.pdf)

Marc Thomas
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Cleanup Programs Branch
703.308.0023

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*********************** ATTACHMENT NOT DELIVERED  *******************

This Email message contained an attachment named
  image001.jpg
which may be a computer program. This attached computer program could
contain a computer virus which could cause harm to EPA's computers,
network, and data.  The attachment has been deleted.

This was done to limit the distribution of computer viruses introduced
into the EPA network.  EPA is deleting all computer program attachments
sent from the Internet into the agency via Email.

If the message sender is known and the attachment was legitimate, you
should contact the sender and request that they rename the file name
extension and resend the Email with the renamed attachment.  After
receiving the revised Email, containing the renamed attachment, you can
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For further information, please contact the EPA Call Center at
(866) 411-4EPA (4372). The TDD number is (866) 489-4900.

***********************  ATTACHMENT NOT DELIVERED ***********************
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Rev.	Date	Description	Written	Checked	Approved
0	31/Oct/2012	First emission	S.MACI	UTC	PCM
A	12/Nov/2012	Revision	S.MACI	UTC	PCM
B	21/Nov/2012	Revision	S.MACI	UTC	PCM
C	29/Nov/2012	Final Revision	S.MACI	UTC	PCM

It is understood that comments on this document have to be made within seven days upon reception. After this time the document, if without comment, can be considered accepted and the engineering activities can proceed on this basis.

SUMMARY

1. Executive Summary

For several decades the North American waste industry has responded to societal and legislative directives to increase waste recycling and reduce landfill deposits - emissions.

The most prevalent response has been residential sorting into three waste streams; paper bag yard wastes, blue bin recyclables (cans, papers and plastics) and brown (or black) bag garbage. The industry developed compost centers and material recovery facilities ("MRFs") to process the first two streams, yard wastes and traditional recyclables, **however the most substantial third stream, brown bag garbage is, for the most part, still landfilled.**

Over the last 20 years the European Union (EU) has coordinated policies for recycling and landfill diversion, and helped develop new technologies and new businesses for waste derived alternative fuels. This allows the successful deployment of recycling and resource recovery programs, which address waste management, climate change and energy efficiencies policies.

As a result Mechanical Biological Treatment (MBT) has been included by the EU in the Best Available Techniques (BAT) BREF 08.2006 (http://eippcb.jrc.es/reference/wt.html) for dealing with waste management issues and environmental policies.

Entsorga with the Hebiot™ (High Efficiency Biological Treatment) process takes Mechanical Biological Treatment to a further level allowing to produce a high quality, high calorific value engineered alternative fuel that can be designed according to the specifications required by different processes including gasification, biomass boilers and clinker production processes as substitute to fossil fuels. This increases recycling, improves air emission profiles of the users and reduces carbon dioxide emissions.

2. Company Background

2.1. *Technology portfolio*

The Entsorga Group and its USA subsidiary based in Martinsburg, West Virginia, for the last 15 years has been successfully manufacturing waste management solutions for public and private entities in Europe. Entsorga is a key player in the European market and has extensive experience in engineering, delivering and operating:

- Treatment plants for kitchen waste and green waste composting in 7 countries. There are currently over 32 already constructed and in operation throughout Europe.
- Engineering, constructing and operating MBT plants for residual municipal solid waste (MSW). In total, 6 MBT lines in 4 facilities using the same Hebiot™ bio hall have been constructed and are operating in Italy, Slovenia and UK. Several of them are producing Solid Recovered Fuels (SRF) with specifications engineered to match the requirements of the different offtakers and processes.
- In-vessel composting and bio-stabilization plants. There are currently over 21 already constructed and in operation throughout Europe.
- Methane degradation devices for landfill gases.
- Biofilters, Ventilation Systems, Automation Systems, and other complementary components for the above plants. Solutions that Entsorga is successfully marketing since 1997.

Entsorga WV is currently working in conjunction with Chemtex International and Apple Valley Waste to construct a MBT Facility plant on Berkeley, West Virginia's old landfill site. The plant is designed to handle 88,000 tons of mixed Municipal Solid Waste and will produce a Solid Refuse Fuel (SRF) as a supplemental fuel for local cement kiln. If approved, it is anticipated that the plant will open and be operational by January 2014.

2.2. *What is Hebiot ™?*

Entsorga has trademarked a unique mechanical biological treatment process called Hebiot™ which delivers uniform, up to spec, fuels that meet or exceed the required calorific value, water content, compositional analysis and physical properties of other fossil fuels. Hebiot™ is a proven technology and is not experimental.The use of the fuel derived from the Hebiot ™ technology allows industry to seamlessly integrate their fuels within their operations. A structured quality control system applied through all the production process ensures further ensurances that the delivered product matches the specification required by the customers and that off spec batches, if any, are segregated and disposed.

In addition, Hebiot™ is environmentally preferable to its competitors and is a proven technology. Commercially deployed in Europe since 2005, the Hebiot™ system allows:

- High landfill diversion rates: 85%-90% of total waste collected compared to 10% to 15% when traditional MRFs are utilized and only glass, paper and metals are recovered/diverted.
- Highly automated process leverages capital to minimize labour and operating costs.
- By exploiting the natural biological effects of aerobic de-composition the HEBioT™ process has a low environmental impact and low energy consumption, relative to other processes.
- A best in class limited footprint for the overall facility and a low impact on the surrounding neighbourhood.
- The recovered bio-mass, plastics and carbon based materials are further processed into a high calorific SRF which is an excellent feedstock for the production of alternative energy.
- The high biogenic content and the avoidance of landfill methane gas emission in the atmosphere allow to offset half ton of carbon dioxide per ton of SRF produced.

Most importantly, unlike other traditional systems where only mechanical sorting and shredding of the different waste streams are used, the Hebiot™ system combines advanced mechanical and optical sorting solutions together with a smart biological stabilization (biodrying) of the feedstock, that ensures delivering a uniform fuel with high carbon content, designed according to the specific needs of the final user, while providing an efficient separation of recyclables (ferrous and non ferrous metals, glass) and unwanted streams like PVC, inerts and fines.

2.3. *Entsorga's commercial successes*

Entsorga has successfully engineered, constructed and operates several MBT projects across Europe. These projects have significantly reduced solid waste, provided a safe and clean supplemental fuel, and reduced green house gas emissions. Some of our projects are listed below:

- **Simbio MBT Plant in Celje, Slovenia**
  (Entsorga Italia S.p.A. & Chemtex International)

The Celje MBT Plant, located in central-eastern Slovenia, is catering to 31 municipalities representing some 250,000 residents.

The mechanical-biological and thermal treatment of this municipal waste has seen positive results, including a reduction in biodegradable waste deposited at landfills.

With the financial backing from the EU, the project has helped solve the problem of how to manage communal waste and dispose of sludge from the waste water treatment plant in Celje. With the introduction of modern treatment methods, the quantity of landfill waste in the targeted waste collection region is on pace to decrease by 62%. The project has also helped ensure that the treatment facilities at the waste management center comply with European technical and environmental standards covering waste and landfills.

- **Deco MBT Plant in Chieti, Italy**
  (Entsorga Italia S.p.A & Chemtex International)

The Deco Plant is a state of the art HebioT™ facility located in Chieti, Italy. The plant's design capacity is approximately 300,000 tons and is currently manufacturing SRF for a number of different users each having its own specification. This plant represents one of the biggest and most modern facilities in Europe. It has been in operation since November 2009 and currently operates near capacity.

- **Santhia MBT Plant, Santhia, Italy**
  (Entsorga Italia S.p.A & Chemtex International)

The Santhia MBT Plant is located in Santhia, Italy. The plant has been designed to process source separated organic waste producing a high quality compost material for agricultural use. The plant's designed capacity is sufficient for the population of approximately 250,000. The plant utilizes Entsorga's proven and proprietary technology called "Scarabeo Automatico". The compost is branded as "La terra dell'acqua" (that stands for "the soil of the water") as the fields surrounding the plant are rise crops flooded for part of the year. We have found that this is very attractive to farmers in the region because the compost produced by Entsorga is free of chemicals, herbicides and pesticides and is a cost effective and environmentally friendly alternative for improving plant health. In addition, the recovery of the organic fraction of waste is in compliance with the latest regulations in terms of biological waste diversion from landfill.

- **Wiltshire MBT Plant, England (under construction)**
  (Entsorga Italia S.p.A & Chemtex International)

Completion of the Wilshire facility is expected by the end of 2012 and will utilize Entsorga's proven HebioT™ system. The company's United Kingdom (UK) arm, in conjunction with Wiltshire County and US engineering company Chemtex, is constructing the MBT plant as part of a resource recovery park for Wiltshire.

The new facility is designed to process 60,000 tons of mixed household waste collected in West Wiltshire each year. It will remove recyclable materials and produce approximately 33,000 tons of refuse-derived fuel to displace fossil fuels. This fuel will then be shipped to Germany or Holland for power generation and manufacturing.

It is expected that the council will avoid paying landfill tax and landfill fines creating a net benefit to the taxpayer.

3. Entsorga MBT Plant: description of the proposed technology

3.1. Overview

The main rationales that were driving the development of the Hebiot™ system are:

- High process automation and equipment reliability
- Cost minimisation, in particular energy costs
- Environmental compatibility and protection
- High productivity
- High flexibility

The main process steps are described in detail in the following sections and include:

- Description of waste acceptance and unloading
- Description of primary mechanical treatment
- Description of biological treatment
- Description of mechanical treatment – refinement
- Process Control System
- SRF compaction, storage and transportation
- Output destination

3.2. Description of waste acceptance and unloading

Every facility defines and agrees with the local haulers and municipalities strict rules and fines about delivery of acceptable and non-acceptable waste for the facility.

On a daily basis in defined hours of operation, non-prohibited unsorted or post sorted municipal solid waste is delivered by dump trucks to the plant. Weight of incoming waste is recorded by a weighbridge by means of dedicated software. The waste is then transported to the waste reception and unloading section.

Incoming residential MSW is discharged from the collection vehicle into a dedicated reception pit through quick opening roller shutter doors. Ventilation slots located at the base of the pit continuously draw air from the reception pit. The air drawn is conveyed to an air effluent treatment system (biofilter) for odour abatement. Hot air can also be blown back into this waste once the doors are closed to rapidly bring the waste to operational temperature.

Since a portion of unsuitable and hazardous wastes can get its way into a general municipal waste flow in despite of waste input control, visual inspection of delivered wastes are executed before launching any of waste treatment processes. The principle that the reception area will be designed on is to obtain the maximum efficiency and flexibility in order to properly deal with the different waste streams and to keep to minimize hazardous wastes from entering the treatment facilities.

In general, unacceptable, oversized, bulky or hazardous items, as well as diverse valuable wastes, which are unsuitable for further mechanical pre-treatment, are picked up by means of the overhead crane and properly managed or disposed of.

Another reception hall is dedicated to the reception of C&I waste. For C&I waste it is intended high quality and selected material mainly composed by rubber and non-recyclable plastics scraps that will be used to blend with the SRF produced from MSW in order to improve the quality of the final product.

The collection vehicle enters the hall through quick opening roller shutter doors, as in the MSW reception area, and unloads the waste directly on the concrete flooring. Within this hall waste is handled by means of a wheel loader.

3.3. Description of primary mechanical treatment

From the reception pit, waste is moved by an automatically controlled bridge crane equipped with a grab, which feeds the hopper of a mechanical bag-breaking and screening device (fast rotary drum).

Instead of using a typical, more energy intensive primary shredder, a low energy consumption bag-opening/screening system is used in this phase to reduce power consumption without compromising the biological process and effectiveness of refining. Additionally, by removing up to 20% of biologically inactive oversize material it improves the efficiency of the following biological phase and provides ≈20% additional capacity in the bio-stabilisation hall, compared to a solution which puts everything through a shredder. The main benefits of this solution compared to systems using a primary shredder at this stage include:

a) Low energy consumption: Avoiding to shred 40% of additional mass that will be eliminated through bioxidation;

b) Fuel Quality benefits: Not shredding the feedstock allows after the bioxidation a much more effective sorting of the different recyclables and unwanted streams, and;

c) Safety benefits: This process avoids damage from large metal objects that can jam shredders and which lead to downtime or in other cases fire hazard.

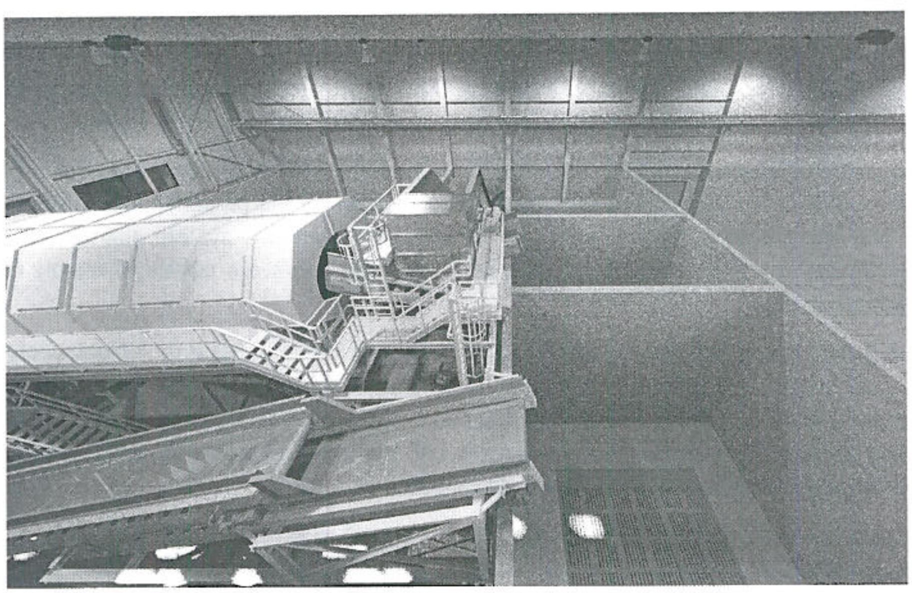


Figure 1. Typical configuration of underscreen and overscreen pits and fast rotary drum

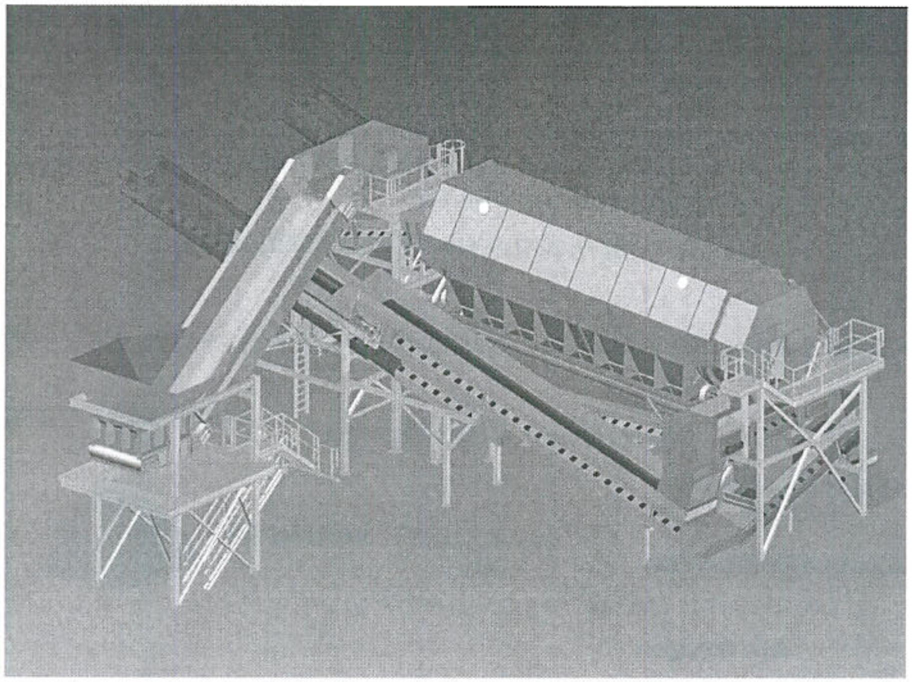


Figure 2. Fast rotary drum with hopper and extraction conveyors.

By rotating, the drum opens the bags and splits the incoming waste into two streams, an oversize fraction ("Overscreen") and an undersize fraction ("Underscreen")[i]. Once separated, the Overscreen is transported by a conveyor to a primary shredder and then to the refining section in order to be used for the production of SRF. The oversize fraction (like non recyclables plastic films, logs, wood, cardboards, textiles and carpets) is mostly biologically inactive and would not play any part during the biological treatment. This fraction is typically expected to be between 10% and 20% of the incoming waste and its removal improves the efficiency and capacity of the following bio-oxidation phase.

The remaining undersize materials is homogenised, in order to create the optimal conditions of density and porosity, and conveyed into the underscreen pit of the bioxidation hall for further processing. This area has a ventilated floor organized in sectors through which air is than blown and drown in order to start, support and control the natural aerobic fermentation of the organic waste.

The C&I waste is taken from the reception hall by means of a wheel loader and charged on a conveyor belt that transports it directly to a shredder and then to the refining line, skipping the biostabilization phase.

3.4. Description of biological treatment

3.4.1. The biological process

The principle of the Hebiot^{TM} system is to harness the biological energy available in the biogenic putrescible fraction of the waste that allows stabilizing and drying the feedstock to an homogeneus 15% water content through a controlled efficient natural process.

The decomposition of organic matter is carried out by a population of microorganisms inhabiting the waste mass (mainly bacteria but also fungi and actinomycetes). The evolution and speed of this aerobic fermentation is directly related to factors that influence the conditions of microbial life such as: oxygen concentration, moisture content, temperature, substrate porosity, C/N ratio and availability of nutrients, pH, presence of inhibitor substances etc.

Under aerobic conditions the biological degradation of substrates rich in organic carbon, performed by microorganisms, is characterized by oxygen consumption and by the production of carbon dioxide, water and heat, as indicated in the following reaction for carbohydrates:

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{Heat (2800 kJ/mole)}$$

More generally:

$$\text{Fresh Organic matter} + O_2 \rightarrow \text{Stabilized organic matter} + CO_2 + H_2O + NO_3^- + SO_4^{2-} + \text{Heat}$$

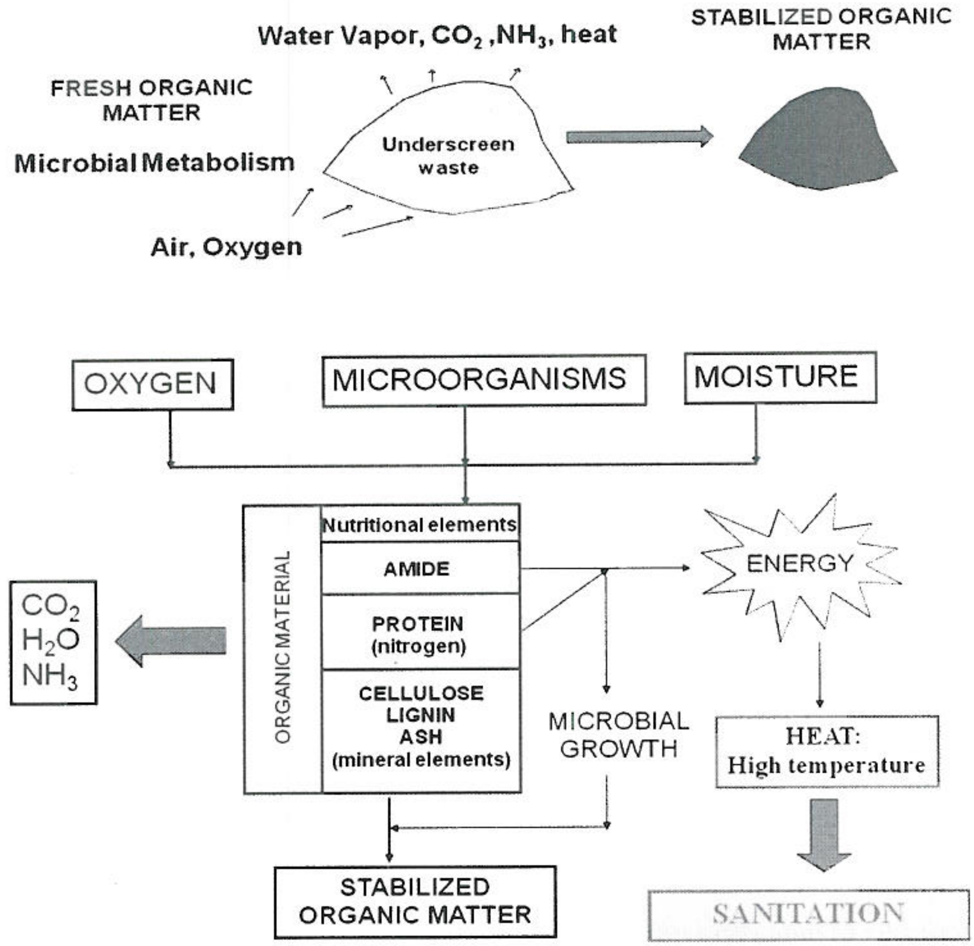


Figure 3. Scheme of aerobic fermentation occurring in waste mass during biological treatment

Water is an essential element for the survival of most microorganisms; when moisture falls below approximately 15% all biological activity ceases, and the material is fully stabilized.

3.4.2. The technological process

The waste from the stock pit is moved into the bio-oxidation area by means of an automatically controlled overhead crane (no wheel loaders). The same automated overhead crane arranges the waste in windrows of height ranging between 4 and 6 metres according to the biological characteristics and density of the material to be treated and on throughput requirements. Between the windrows there will be no gaps nor walls.

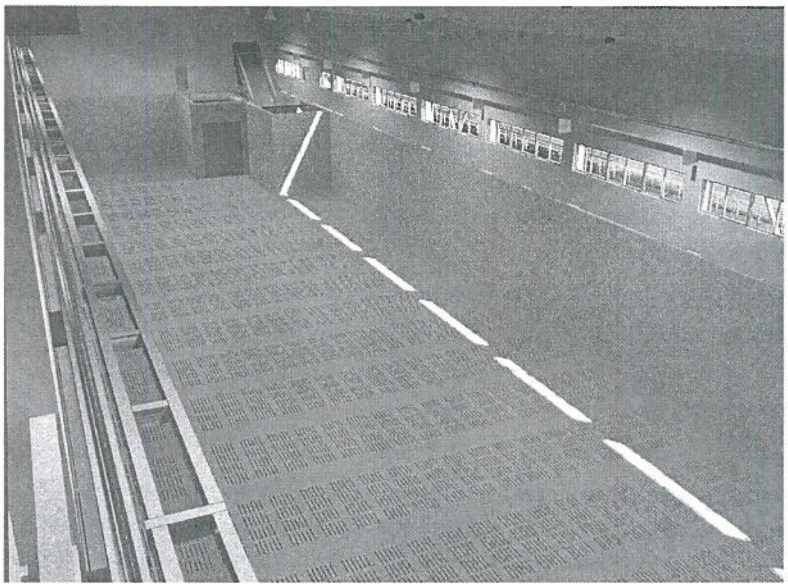


Figure 4. Internal view of a typical biostabilization hall.

In the bio-stabilisation area, waste rests on specially designed slotted, prefabricated, concrete flooring, to allow air to be drawn through or blown into separate batches. A void space, underneath the slotted flooring, acts as a "plenum" to allow an even air pressure and a uniform distribution of air in the material.[ii]

The heat developed by the aerobic fermentation dries out the waste. The moisture of the material is continuously controlled by means of moisture evaluation software that gives an indication of the drying level of the waste and maximize the decay. [iii]

When the stabilizing mass has reached the expected level of moisture reduction, the control system stops the process. The mass reduction resulting from this treatment is in the range of 25-35% and the resident time for each treatment cycle equals to around 14 days or less (depending upon incoming moisture contents).

A unique proprietary characteristic of Entsorga Hebiot™ MBT biological treatment step is that forced air is alternatively blown into and sucked from the waste piles (zone by zone), creating the so called "reverse-flow bio-reactor". This is a strong differentiator of the Entsorga MBT process in comparison to other available MBT processes providing numerous process efficiencies. The "reverse-flow" system enables Entsorga to control the moisture and bio-degradation <u>more uniformly</u> through the cross section of the waste pile and improve bio-stabilisation rates. As a result it can achieve lower moisture contents in shorter time if compared to other existing MBT processes, thus improving overall process efficiency, allowing to produce a homogenous fuel conforming to the tight specifications of the final users.

Existing MBT processes with only a single air-flow direction, end up with a moisture and organic carbon gradient through the cross section of the waste pile, where the final product is "over-dried/non-stabilised" in the higher levels of the waste pile and "moist/composted" in the lower sections of the waste pile.

The frequency of the air-flow reversal is mainly dependent upon the feedstock waste composition and the waste pile height. This is again driven by a complex algorithm and managed automatically by the control system that cross-checks, temperature, residence time, and water content to adjust air flow-rate and direction, with the aim of achieving the process targets as rapidly and homogeneously as possible.

Furthermore, because of the possible delay in bio-oxidation start-up during cold days, the system can pre-heat the incoming waste by blowing in warm process air. This can improve treatment times by 1-2 days in cold conditions.

In order to maintain the plant as a whole in negative pressure and avoid any odour release the control system manages the air-flow zone by zone in such a way that there are always more zones under air suction than zones under blowing. If for any process reason this is not possible, an additional suction fan is available to guarantee the negative pressure.

The development of the software controlling the system, the selection of the hardware and the optimisation of the mechanical operation constitute an important and unique element in the efficient operation of the Hebiot™ technology.

3.4.3. The bridge cranes

Two fully automatic overhead cranes equipped with grabs control the movement of the material within the treatment building. These are controlled using state of the art electronic systems ensuring rapid response and accurate movement. The overhead cranes are the heart of the plant; as a consequence particular emphasis is placed on ensuring that the mechanical, electronic and electrical details are robust so as to guarantee their operation 24 hours a day in an environment that has an extreme microclimate (dust, temperature and humidity).

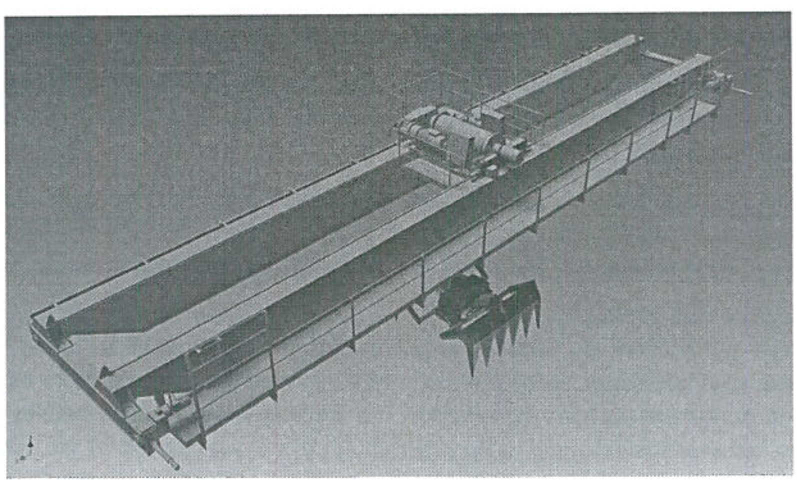


Figure 5. The bridge crane equipped with grab.

3.5. Description of mechanical treatment - refinement

The material coming from the biological phase is stabilised, due to the degradation of the organic putrescible fraction, and dried, as the water content has been greatly reduced due to evaporation (25-35% of the input mass).

Once the material has been stabilised in the biological section it is moved using the overhead crane to the SRF refinement section where the unwanted fraction will be sorted out and the material will be conditioned up to the specification required.

The refinement section is a very efficient set of the following equipments:[iv]

- *Hopper:*
- *Overscreen and C&I Primary shredding*
- *Primary screening trommel*
- *Air classification*
- *Iron and other Fe-metals removal*
- *NIR (Near Infra Red) PVC removal*
- *SRF shredding*
- *Non-Fe metals removal*
- *Compaction and storage*

Four principal material streams are produced:

- *Solid Recovered Fuel (SRF)*
- *Fines & heavies containing the undersize organic fraction and inerts*
- *Ferrous and non ferrous metals for recycling*
- *PVC plastic*

Figure 6: Typical layout of the refinement line[v]

3.6. Process Control System

The control system allows operators to remotely operate the whole plant without exposing them to the bioxidation section, whilst at the same time is interfaced with all the plant machinery and monitors and manages conveyors, doors, lighting systems, pumping units, surveillance systems etc. The automation of equipment management system is a decisive factor to the attainment of the plant's high efficiency standard.

Since the system monitors and records all activities, it can be constantly controlled which in turn guarantees a high level of environmental control, process management and final management of any emissions.

The system is managed from a control room positioned at the head of the plant. From here all the machinery and operation are monitored via the supervisory computer. The control room faces onto the inside of the plant through a glass partition that allows visual observation of the plant.

Additionally, the computer system can be controlled remotely through broad band Internet connection, allowing Entsorga to assist with operation if necessary.

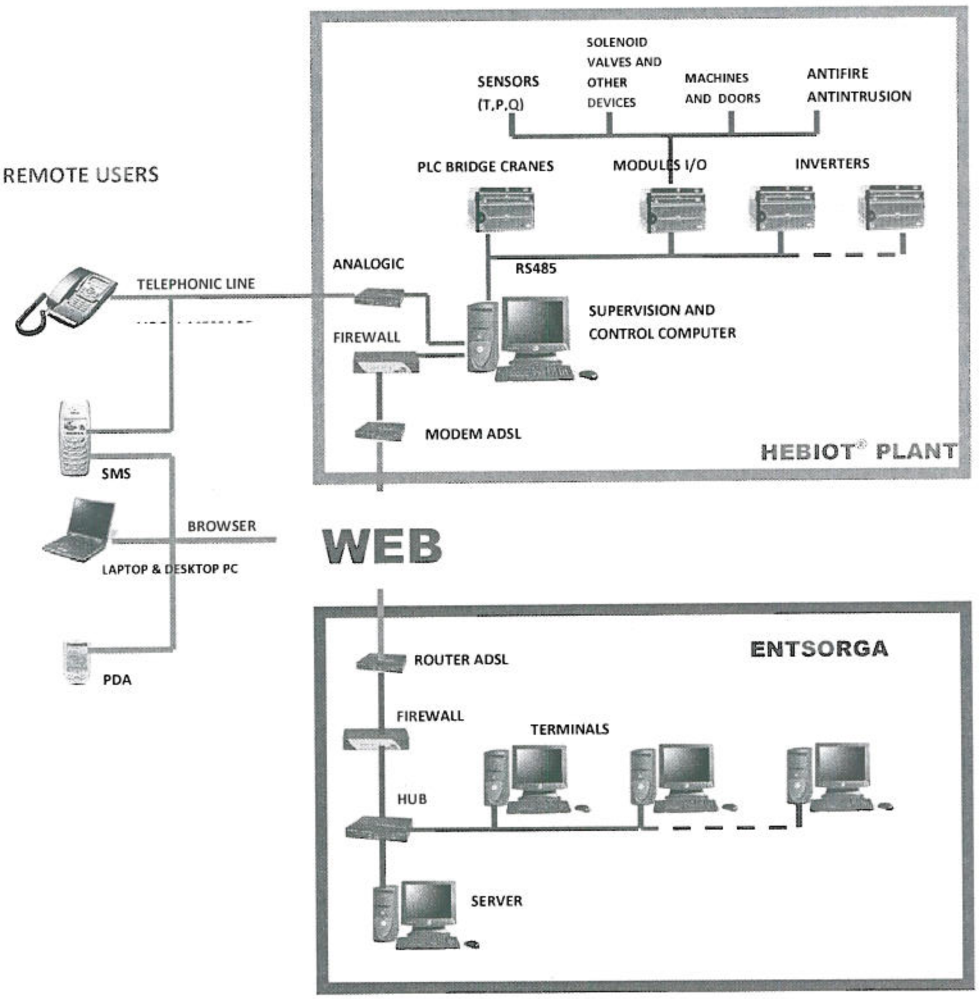


Figure 7. The control system

The automation system is the tool that makes it possible to produce alternative fuel at different specification as needed by the final users by managing and controlling the following process operations and parameters:

- Programming, management and control of the working cycle of the bridge cranes. Specialized software has been internally developed to allow high speed bridge crane operability (twice as fast as market standard).
- Programming, management and control of shredder processing based on internally developed specialized software.
- Monitoring the waste drying level through the application of a software algorithm based on the measurement of humidity, temperature and flow rate from the extracted air.
- Control and management of fans based on a process management program which works on input batch data and regulates the air capacity working on inverters.

- Aspiration temperatures are controlled continuously from the aspiration pipes by sensor probes.
- Electric humidification valves for the Biofilter are activated automatically.
- Monitoring of the humidity, temperature and filtering bed pressure drops. Management of the irrigation cycles.
- Start, stop and management of the refining line.
- Interface to Plant Alarm System.
- Monitoring of Plant Power Consumption and source (direct or generator).

The operator interface is composed of screens that visualize the graphical and functional diagrams of the processing parameters. The input of these parameters allows the user to correctly set each working cycle depending on the final SRF specification desired. All data are in a format that can be read by the admin programs of office automation. The input data comply with the requirements of UNI-ISO 9000 in terms of documentation.

Figure 8. Screenshot of the doors control at reception.[vi]

Figure 9. Receiving and pretreatment section Control System[vii]

Figure 10. Independent batch ventilation control and process monitoring system.[viii]

Figure 11. Detail screenshot of batch control system with the evolution of the main parameters.[ix]

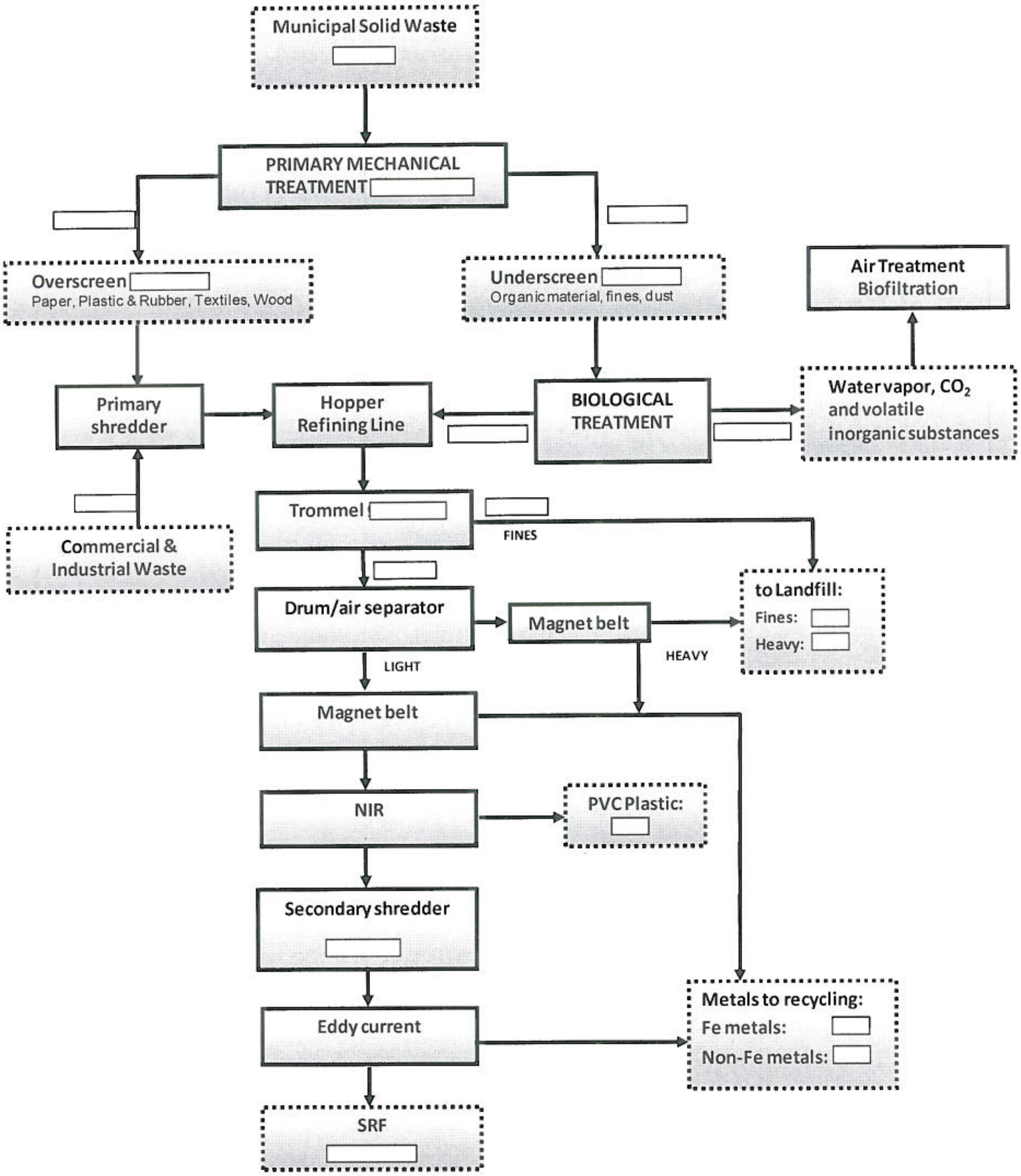
Figure 12. Screenshot of the high speed Bridge Crane handling system.[x]

Figure 13. Screenshot of the configuration page for the main process parameters.[xi]

Figure 14. Refining process control system and output[xii]

3.7. Overall flow chart and mass balance

The following mass balance is indicative and can vary depending on specific input waste characteristics and on the required SRF specifications required by the specific customer.[xiii]



3.8. Output destination

The mechanical refinement of the product, by eliminating inerts, metals and undesired plastics allows the production of SRF at spec and the recovery of recyclable materials. All the extracted materials will be segregated, properly stored, managed and delivered to landfill or specific offtakers to be disposed of or transformed or recycled.

- Ferrous and non-ferrous metals separated by high efficiency magnetic and eddy current separators will be transported by conveyors and temporarily stored in containers, awaiting to be marketed and delivered to Material Recovery Facilities where they will be recycled and valorised.
- PVC plastics, after separation with high efficiency Near Infra Red system, will be transported by a conveyor and temporarily stored in containers in order to be sold into the PVC recycling market.
- After the final sieving, the underscreen process residue will be discharged in containers and promptly delivered to the existing county landfill. The project will annually require an expected 10,000 – 15,000 tons of landfill capacity. The residual material will mainly consist of inerts and fine materials; therefore, it will be relatively dense and will require minimal landfill air space. They may be qualified as a beneficial use product and can be used by the landfill as road base or alternative daily cover material. In addition, during the construction phase, construction and demolition debris will require disposal at the county landfill.
- Leachate will be captured throughout the facility with a leachate collection system. Approximately 50% will be re-circulated into the facility and ultimately evaporated. The remaining 50% will be sent to the local wastewater treatment plant.

3.9. SRF compaction, storage and transportation

SRF is produced at size and specifications that match the final users requirements. In most of the cases the final user will opt for a 35x35 mm dimensions (1.38x1.38 inches) in the form of fluff as it is intended to be pneumatically fed to the burners.

The SRF is preferably produced just in time. When storage is required at site it usually baled and wrapped or stored into enclosed containers.

Similarly to coal, when storage is required by the final user at site it will be stored in enclosed bunkers with suitable fire detection and fire fighting system and managed by means of automated systems.

Due to a self-compacting physical properties, SRF can be transported in bulk to customers by means of sealed walking floor trailers or press containers and delivered at sealed docking stations specifically designed to prevent alternative fuel from dusting the surroundings and equipped with fabric filters. Due to the expected close proximity of the MBT facility to the user plant (located within 10 miles of each other), the amount of SRF stored at both locations will be minimized.

When long distance shipment is required the SRF can be pressed, baled, wrapped and shipped into closed containers.

According to customers requirements the SRF can be also pelletized, however in most of the cases, the fluff form is preferred by the final users, since it makes SRF to be easily fed to the dedicated burners by means of pneumatic conveying systems. In addition, the densification of the material in pellets is a very energydemanding process, which would result in higher costs and higher environmental impact and carbon footprint of the whole facility.

4. Air treatment

4.1. Biofiltration

In the bioxidation area the environment produced by the fermentation activity leads to the production of odours that need to be carefully managed in order to avoid impact on the surrounding neighbourhoods.

The Hebiot^{TM} plant is fully enclosed and its internal space is continuously kept in negative pressure avoiding any odour release outside the building. A separate air ventilation system is designed to neutralize odours by aspiration from inside the reception and bioxidation building and subsequent venting through the biofilter for air purification. The system can guarantee 2-4 air renewals per hour.

The bio-filter is the conventional approach to effluent air treatment, and is considered the most effective for odour control.

Biofiltration is a biological process that reduces the odours through the use of a mixed population of microorganisms, including bacteria, mildews and yeasts, that all work as natural agents for odour removal.

These microorganisms metabolise most of the organic and inorganic compounds produced during bioxidation through a wide series of reactions that transform the compounds into odourless products.

The microbial colony resides on the surface of a natural support through which the air to be treated is blown. The support, which is the 'bed' of the biofilter may be formed of mould, peat, woody pieces, green compost, or by a mixture of these and other materials.

The odour emissions are absorbed by the filtering material and degraded by the microbial flora, which uses it as nutrient together with the woodbark itself. The biological activity requires an oxygen supply that is provided by the same exhaust air entering the biofilter. The biological reaction emits carbon dioxide (CO_2), water, inorganic compounds and biomass. Below are some of the typical biologic reactions of the biofilter:

$$\mathbf{H_2S + 2O_2 \rightarrow Bio \rightarrow SO_4^{=} + 2H^+}$$

$$\mathbf{NH_3 + H_2O \rightarrow Bio \rightarrow NH_4^+ + OH^-}$$

$$\mathbf{2NH_4^+ + 3O_2 \rightarrow Bio \rightarrow 2NO_3^- + 8H^+}$$

$$\mathbf{volatile\ organic\ compounds + O_2 \rightarrow Bio \rightarrow CO_2 + H_2O}$$

Below are the key characteristics of the system:

- Completely natural processes: No man made chemical substances are used.
- The process is not selective: Through it's a biological and not a chemical processes the biofilter can reduce different types of odours.
- No installation required: The system structure is on the ground and easily accessible to control and maintain (in standard configurations).

- Low energy cost: The high porosity and limited height of the biofilter allows reduced load losses and the use of ventilation plant with low power absorption. The sprinkler system for the biofilter works automatically. Moreover no further pumps for chemical additives are necessary, as compared to other odour reduction technologies.
- Low maintenance: Several tests are necessary to check the temperature and humidity of the filter, the working order of the fans and nozzles (daily basis), load loss (monthly basis), to check for wear and tear, and to check the pH of the filtering bed (control required every 6 months, during which time it is necessary to check the effectiveness of odour control). However these tests are minimal and also not technical allowing the plant to continue operation both before, during and after the tests.
- Long Lasting: Filtering material lasts on average between 2 - 5 years, depending on the wear rate and the microbiological depletion. At the end of this period the filter bed must be replaced.

At the end of its working life, the disposal of the biofilter has no environmental consequence - no chemical agents are used so there is no question of secondary pollution. The biofilter can be sent to the landfill site or, if it has the required composition, may be used as a fuel.

4.1.1. Biofilter Description

Entsorga's biofilter consists of a modular tank. Inside the tank there is a PVC watertight liner, a modular grid to allow air flow and above that the filtering bed. Underneath the filtering bed and below the supporting grid there is a plenum through which air is blown. The air passes through the filter bed and it is released to the atmosphere. The grid is made up of modular polypropylene tiles with polypropylene support columns 500 mm high. The load bearing capacity is 1000 kg/m^2.

The bottom of each biofilter is slightly sloped in order to convey the percolate through the draining pipes.

The biofilter is completed by a moistening system for the filtering material. The system is made of a network of sprinkler nozzles positioned above the biofilter itself. Moistening of the Biofilter is automatic and is triggered by sensors (to measure the humidity of the bed), using the management software, which operates the sprinkler nozzles.

4.2. Dedusting system of refinement areas

In the refining facility all conveyor belts and drop over points are covered, all equipment is shielded to prevent materials and dust "leaking" and contaminating the area around the refining section. The system guarantees 2 air renewals per hour for the entire refining section.

4.2.1. System description

A bag filter with a minimum capacity of about 60,000 Nm^3/h for SRF refining is provided. The filter is positioned outside the refining hall, on a dedicated site.

Technical characteristics:

- Bag Filter: rectangular section, cleaning of filter bags with compressed air, extraction from above, complete with ladder
- High Efficiency Fan: The fan is complete with transmission and motor, with closed impeller

- Dash Board: There is an electric cabinet switchboard for management of all components of equipment and control of system, complete with pressure gauge to control stoppage of filter.

5. The Plant

All treatment phases occur in enclosed buildings.

All the air extracted from the bioxidation building is cleaned by means of a biofilter in order to abate dust and odours (proven efficiency >99%). The SRF refining line and the C&I waste receiving hall have a dedicated dust removal system with suitable bag filters.

The following table summarizes the general plant costs, the plant footprint and the specific energy consumption. The figures below refer to a 90,000 t per year plant.

Plant buildings footprint	21x80m + 40x30m (2,880 m^2 - 344,400 yd^2)
Capital investment	19,000,000 $
Treatment overall costs	65 $/$t_{MSW\ (metric\ tonnes)}$
Energy consumption	45 kWh/$t_{MSW\ metric\ tonnes}$ 153,500 Btu/$t_{MSW\ metric\ tonnes}$
Energy obtainable from the SRF	17 MJ/kg = 4720 kWh/t = 16,112,000 Btu/$t_{metric\ tonnes}$

Figure 15. SRF Plant in Chieti (Italy): capacity 270,000 tpy MSW.

6. Accordance to legitimacy criteria

6.1. SRF as an engineered fuel

From what has been described in the chapters above the following points can be highlighted:

1. The waste treatment implies a massive investment: from 19 M$ up.
2. The waste treatment is a full process lasting up to 14 days and implying both mechanical and biological treatment under strict continuous monitoring by an automated system supporting the operators.
3. A further blending step with selected C&I waste will improve “the recipe”.
4. The process and an optimized design, thus including any detail and ancillary units, makes the Hebiot™ a comprehensive state of the art system for fuel production.

5. Patents and patents applications cover the process and the plant.

For the above reasons the SRF produced by Hebiot™ is a full engineered fuel.

6.2. SRF as a valuable commodity

The Entsorga Hebiot™ MBT process has been designed and developed to produce a useful engineered fuel from mixed waste streams, to be used preferably as alternative fuel for industrial burners such as cement kilns to supplement their existing coal use (15% - 35%). As we discussed in earlier transmissions, the Hebiot™ SRF has been proven to be considered as a valuable commodity since it has a market value and gives consistent revenues to the MBT producer and savings to the user. A SRF supply contract has been signed with Essroc Cement in USA, awarding to SRF a selling price of $28 per metric ton ex-works. Upon request the commercial agreement can be provided.

In addition, the supply rate of the SRF to customers is expected to be quite regular, enabling the combustion units to burn the fuel almost promptly after delivery, without the need to store it longer than a "reasonable time frame", as required by the NHSM final rule (40 CFR 241.3(d)(1)(i)(A)).

6.3. SRF characteristics: meaningful heating value

The standardization of the RDF is an issue still under discussion in the European technical committees like the CEN TC 343. The last updated technical rule in Europe is the EN 15359:2011 "Solid recovered fuels - Specifications and classes", which defines a classification system for SRFs based on limit values for three important fuel properties (Table 1). These are:

- the mean value for net calorific value (ar);
- the mean value for chlorine content (d);
- the median and 80th percentile values for mercury content (ar).

Each property is divided into 5 classes with limit values.

The SRF is assigned a class number from 1 to 5 for each property. A combination of the class numbers makes up the class code (see example below). The parameters are of equal importance and thus no single class number determines the code.

As can be seen in Table 1, the net Calorific Value envisaged by the European technical legislation for accepting a material as a valuable SRF may vary from >3 to >25 MJ/kg, which represents a very wide range.

Table 1. Classification system for solid recovered fuels.

Classification property	Statistical measure	Unit	Classes				
			1	2	3	4	5
Net calorific value (NCV)	Mean	MJ/kg (ar)	≥ 25	≥ 20	≥ 15	≥ 10	≥ 3

Classification property	Statistical measure	Unit	Classes				
			1	2	3	4	5
Chlorine (Cl)	Mean	% (d)	≤ 0,2	≤ 0,6	≤ 1,0	≤ 1,5	≤ 3

Classification property	Statistical measure	Unit	Classes				
			1	2	3	4	5
Mercury (Hg)	Median	mg/MJ (ar)	≤ 0,02	≤ 0,03	≤ 0,08	≤ 0,15	≤ 0,50
	80^{th} percentile	mg/MJ (ar)	≤ 0,04	≤ 0,06	≤ 0,16	≤ 0,30	≤ 1,00

Example of classification:

The class code of a SRF having a mean net calorific value of 19 MJ/kg (ar), a mean chlorine content of 0,5 % (d) and a median mercury content of 0,016 mg/MJ (ar) with a 80^{th} percentile value of 0,05 mg/MJ (ar) is designated as:

Class code NCV 3; Cl 2; Hg 2.

As stated by the USEPA in the preamble to the NHSM final rule, a Non Hazardous Secondary Material with an energy value greater than 5,000 Btu/lb (11.63 MJ/kg) can be considered to have a meaningful heating value.

The versatility of Hebiot™ SRF technology allows a number of calibrations to match different waste streams with different RDF specifications. The LHV can be calibrated, for example, by varying the trommel mesh size and/or the air classification efficiency in the refinement line, getting more or less fines and heavies discarded and thus enhancing or reducing the fraction of more energetic materials in the final SRF.

Table 2. Average and standard deviation values of LHV, moisture and ashes in SRF produced in an analogous Slovenian plant.

SRF NON-CONTAMINANT ANALYSES			
	Units	CELJIE (SL) Plant	
		Average	dev.std
Moisture	wt%	29.99	3.53
Ashes	wt%	9.49	2.01
LHV	kJ/kg	12,784	1,066
LHV dw	kJ/kg dw	19,246	1,043
LHV	Btu/lb	5,495	458
LHV dw	Btu/lb dw	8,273	448

In Table 2 average and standard deviation values for LHV, moisture and ashes of SRF produced in the Slovenian Hebiot™ Plant are reported. As can be seen, in this specific case the process has been calibrated in order to keep the moisture quite high and, consequently, the LHV low, because the SRF is burned in a Biomass Waste-to-Energy facility which is not designed to use a high energy combustible. In fact originally the Celje plant was designed to produce and produced SRF with calorific value up to 21,000 KJ/Kg, and just when the final user decided to have a lower LHV, the plant was tuned to produce the SRF shown in the table. In general the enhancement of the bio-drying process and the fine calibration of the refinement section can allow producing SRF at spec with significantly higher calorific value compared to the values indicated in table 24.

In addition, the LHV of SRF can be enhanced and fine tuned by modulating the blend with Commercial & industrial rubber and plastic scraps, with the aim to keep its value in the range of 17 ± 2 MJ/kg (7,300 ± 860 Btu/lb), and confidently meet the minimal requirements of Essroc Cement for accepting SRF in the Martinsburg Cement Plant (WV) as a substitute of the currently used coal.

6.4. SRF characteristics: comparability of contaminant levels

Apart from imparting to the produced SRF fuel-like qualities relative to coal (homogeneity and meaningful energy content), the Hebiot^{TM} MBT process reduces SRF environmental impact by markedly reducing contaminant levels compared to those of input waste. After the completion of the process, the SRF is as far as possible free from non combustible materials, inert materials, and harmful materials (materials with significant contaminant concentrations when combusted like PVC, electronics, batteries, dusts etc.

The Hebiot^{TM} SRF is both homogeneous and consistent over space and time. It means that the engineered fuel has good characteristics of energy content and contaminant levels which do not vary appreciably within a single batch and/or across multiple batches and/or across batches produced on different dates. This homogeneity is further enhanced by blending the processed municipal waste with C&I waste in specific proportions.

Table 3. Average and standard deviation values of the main contaminants in SRF produced in an analogous Slovenian plant.

SRF CONTAMINANT ANALYSES						
	Units	CELJIE (SL) Plant		Literature Sources	OAQPS (Coal) (*)	
		Average	dev.std	Range (°)	Average	Upper end of range
Antimony (Sb)	mg/kg dw (ppm)	5.81	2.00	0.5 - 10	1.7	6.9
Arsenic (As)	mg/kg dw (ppm)	1.36	0.28	0.5 - 80	8	174
Beryllium (Be)	mg/kg dw (ppm)	< 1.00	--	0.1 - 15	2	206
Cadmium (Cd)	mg/kg dw (ppm)	< 0.70	--	0.1 - 3	1	19
Chlorine (Cl)	mg/kg dw (ppm)	3,750.00	2,232.87	--	992	9,080
Chromium (Cr)	mg/kg dw (ppm)	56.19	28.08	0.5 - 60	13	168
Cobalt (Co)	mg/kg dw (ppm)	1.53	0.44	0.5 - 30	6.9	25.2
Fluorine (F)	mg/kg dw (ppm)	62.50	15.81	--	64	178
Lead (Pb)	mg/kg dw (ppm)	27.41	17.20	2 - 80	9	148
Manganese (Mn)	mg/kg dw (ppm)	137.21	34.09	5 - 300	26	512
Mercury (Hg)	mg/kg dw (ppm)	0.37	0.09	0.02 - 1	0.1	3.1
Nickel (Ni)	mg/kg dw (ppm)	14.18	5.50	0.5 - 50	22	730
Nitrogen (N)	mg/kg dw (ppm)	10,212.50	3,110.09	--	15,090	54,000
Selenium (Se)	mg/kg dw (ppm)	< 2.10	--	0.2 - 10	3.4	74.3
Sulfur (S)	mg/kg dw (ppm)	1,382.75	502.18	--	13,580	61,300
	N. of analyses	8				

(*) EPA reported value of Contaminant Concentration in traditional fuels: Tables for comparison November 29, 2011

(°) Clarke and Sloss (1992)

Hebiot™ SRF main chemical and physical characteristics are shown in Table 3, which report parameters average and standard deviation from an analogous plant located in Celje Slovenia (the Celje plant does not include NIR equipment, so values of chlorine are expected to be substantially lower than here and comparable to coal specifications) . Actual analyses values are summarized in Annex 1.

As can be seen, the parameters show average contaminant levels lower or equivalent to coal, as reported by literature or by USEPA Office of Air Quality Planning and Standards. The values of standard deviations confirm that, for a determined input waste composition, the **variability among batches is quite restrained**. It has to be noted that this reference plant is not equipped with NIR PVC removal equipment, thus chlorine concentrations of SRF produced in future plants are expected to be significantly lower than those presented here.

In addition, all the SRF contaminant levels are comprised within the limits imposed by Essroc Cement for accepting it as an alternative fuel in the Martinsburg Cement Plant. Sometimes, Essroc acceptance limits for contaminants are even higher than the upper end of coal concentration ranges. This can be justified by considering that some heavy metals tend to be incorporated in the clinker structure during the manufacturing process. For this reason they are scarcely transferred to combustion gases and then do not represent a significant impact to atmospheric emissions. Antimony concentration, that in Hebiot™ SRF can be occasionally slightly higher than coal, is however below the acceptance limit imposed by the cement manufacturer, thus not entailing any additional pollutant load compared to current situation and ensuring a complete compliance with burner emission limits.

The fuel specification that Entsorga applies to be recognised as non waste fuel is the following.

Table 4. Specification for Entsorga's *Prometheus* engineered fuel as required by ESSROC

		Unit	Limit
Net Calorific value	Min	GJ/T ar	≥12
Moisture content	Max	% ar	25
Chlorine	Max	mg/kg (ppm) d.m.	9,000
Bromine	Max	mg/kg (ppm) d.m.	2,000
Fluorine	Max	mg/kg (ppm) d.m.	175
Iodine	Max	mg/kg (ppm) d.m.	trace
Sulphur	Max	mg/kg (ppm) d.m.	60,000
Mercury	Max	mg/kg (ppm) d.m.	3
Cadmium & Thallium	Max	mg/kg (ppm) d.m.	19
(Total Group III)	Max	mg/kg (ppm) d.m.	
Antimony	Max	mg/kg (ppm) d.m.	6.9
Arsenic	Max	mg/kg (ppm) d.m.	50
Chromium	Max	mg/kg (ppm) d.m.	160
Cobalt	Max	mg/kg (ppm) d.m.	25
Copper	Max	mg/kg (ppm) d.m.	300
Lead	Max	mg/kg (ppm) d.m.	145
Manganese	Max	mg/kg (ppm) d.m.	300
Nickel	Max	mg/kg (ppm) d.m.	100
Tin	Max	mg/kg (ppm) d.m.	200
Vanadium	Max	mg/kg (ppm) d.m.	100
PCB	Max	mg/kg (ppm) d.m.	50
Ash	Max	% d.m.	25
Size			
2-D		mm	100x100 for precalciner 30x30 for main burner
3-D		mm	100x100x10 for precalciner 10x10x10 for main burner

Where not specified the limit is intended as upper limit

7. SRF Quality control

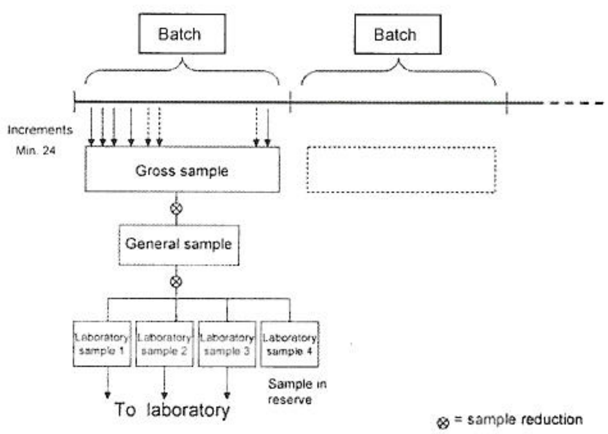
A SRF Quality Management System will be implemented at the facilities in order to constantly control the fuel characteristics and its conformity to the needs and specifications required by the users.

An automated sampling device will extract representative SRF samples from the production stream, which will be periodically analyzed according to the Monitoring Plan in order to control a wide array of potential pollutants and to verify SRF quality and environmental safety.

7.1. Batch definition and samples collection and handling

According to the European technical rules EN 15359:2011 and EN 15442:2011, a batch of SRF is defined as an amount of product equal or lower than 1,500 t. For each batch an array of compulsory parameters has to be analysed (see Table C below).

The sampling principle is shown in the figure below:



The samples number and size depends on SRF characteristics such as particle size, shape, density etc and on sampling methodology (sampling on heap, vehicle or automatic sampling) and is calculated according to EN 15342:2011. The sample's granulometric and size reduction is then carried out according to EN 15343:2011.

7.2. SRF Monitoring Plan

7.2.1. Monitoring Plan definition

The Monitoring and Analysis Plan (MAP) is defined by the Technical Direction (Quality and Environment) in agreement with the Laboratory Direction. The MAP is issued in the plant Intranet and is annually revised during budget revision. The MAP consists essentially of three tables:

Table A – Samples delivery Plan, which defines the materials typology to be delivered to the Laboratory Direction. The following instructions are reported in the table:

- *Category*: the "family" of materials to be analysed;
- *Sample type*: mode of sample collection;

- *Sample treatment*: mode of sample processing;
- *Quantity*: amount of sample to be delivered to the Laboratory Direction, and;
- *Delivery frequency*: frequency of sample delivery from Production Dept to Laboratory Direction. Usually samples are delivered weekly, except where specifically indicated.

Table B – Laboratory Analysis Plan, which defines the analysis to be carried out by the Laboratory Direction. The following instructions are reported in the table:

- *Analysis Frequency:* weekly, monthly, four-monthly, etc depending on plant capacity and annual number of batches;
- *Analysis Type:* analysis code which groups homogeneous analyses as detailed and codified in **Table C**;

TABLE A SAMPLES DELIVERY PLAN				
Category	Sample type	Sample treatment	Quantity	Delivery frequency
SRF	Batch average sample reduced according to EN 15442:2011	According to EN 15443:2011	According to EN 15443:2011	Weekly

TABLE B ANALYSIS PLAN			
Category	Material type	Analysis frequency	Analysis type
Alternative fuel	SRF (Solid Recovered Fuel)	Weekly	C1
		Weekly to Monthly according to annual plant capacity and number of batches	C2

TABLE C: SRF ANALYSIS			
Parameters	Units	Code	
		C1	C2
pH	pH unity	✓	✓
Dry matter	%	✓	✓
Moisture content	%	✓	✓
Ash	%	✓	✓
Bulk density	g/l	✓	✓
LHV	KJ/Kg	✓	✓
LHV	KJ/Kg dm	✓	✓
Carbon	mg/kg dm	✓	✓
Hydrogen	mg/kg dm	✓	✓
Nitrogen	mg/kg dm	✓	✓
Fluorine	mg/kg dm	✓	✓
Chlorine	mg/kg dm	✓	✓
Sulfur	mg/kg dm	✓	✓
Mercury	mg/kg dm		✓
Cadmium	mg/kg dm		✓
Thallium	mg/kg dm		✓
Antimony	mg/kg dm		✓
Arsenic	mg/kg dm		✓
Chromium	mg/kg dm		✓
Cobalt	mg/kg dm		✓
Lead	mg/kg dm		✓
Manganese	mg/kg dm		✓
Nickel	mg/kg dm		✓
Beryllium	mg/kg dm		✓
Selenium	mg/kg dm		✓
Vanadium	mg/kg dm		✓

7.2.2. Samples management

The Production Department shall prepare the samples to be analysed and deliver them weekly to the Laboratory Direction. Samples shall be packaged in properly dimensioned polyethylene vessels, closed with double cover, properly labelled and accompanied by a sample form, indicating the analyses required to the Laboratory Direction according to the codes of Table C. A copy of the form shall be saved in the Plant in a dedicated folder. Samples shall be delivered by the beginning of the week following the one to which they relate.

7.2.3. Analysis reports

All analysis reports are issued and made available in electronic archive through the plant Intranet. Access to reports is allowed to the business roles and functions authorized by the Technical Direction by means of assigned user profiles.

The results of SRF analysis shall be sent from the Laboratory Direction to the Technical Direction/Environment in *.xls* format.

8. Environmental benefits

There are some additional environmental benefits that are important to be highlighted.

The fuel has a biogenic content (higher than 40%) thus making it possible a massive CO_2 diversion that is in the range of 0.4÷0.5 t for each ton of SRF used. This calculation has been made following the UNFCC rules for carbon credits calculation under the CDM rules. Just to make an easy comparison a medium size cement plant that will substitute 20% of the coal used with 30,000 tons per annum of SRF will offset 16,000 tpa of CO_2 equal to taking ≈8,000 cars (20,000 km/y each) off the road each year or the reforestation of an area equivalent to ≈92 soccer fields each year.

It has been measured under the supervision of the Italian Department of Environmental Protection in a combustion test of the SRF in the Calusco cement kiln plant in Italy that the emissions at the stack have improved if compared with the valued measure with coal only. Test report available on request.

The landfill diversion achieved, higher than 75%, makes it possible not only to avoid massive methane emission but also leachate production and all the collateral negative effect connected with the landfill such as odour release, possible underground contamination, vermins etc.

The energy consumption of the plant is about 153,000 Btu/t calculated on the incoming MSW and about 382,500 Btu/t if calculated on the SRF produced. If we compare these values to the value of the SRF 16,000,000 Btu/t it is clear that the energy consumption for such treatment is very low thanks to the fact that most of the treatment energy is biologically supplied by the waste itself. In environmental terms this is a really HIGH EFFICIENCY PROCESS.

9. External references

Entsorga website www.entsorga.it

The Twenty-Sixth International Conference on Solid Waste Technology and Management Philadelphia, PA, USA March 27 - 30, 2011. "European experiences towards the zero landfill targets - When Integration of traditional industries, waste facilities and new technologies can trigger environmental and economic benefits." Downloadable at http://www.entsorga.it/news_dettaglio.php?nId=108

Videos:

The Hebiot system http://vimeo.com/18115093

The Celje Plant http://vimeo.com/18118396

10. Annex 1

Parameters	Units	Methods	1226417-001	1226417-002	1226417-003	1226417-004	1226417-005	1226417-006	1226417-007	1226417-008	Average	Std. Dev.
		Date of sampling	06/11/12	07/11/12	05/11/12	31/10/12	30/10/12	02/11/12	03/11/12	29/10/12		
pH	unit pH	CNR IRSA 1 Q 64 Vol 3 1985	6.40	6.40	6.40	6.40	6.20	6.20	5.80	6.30	**6.26**	**0.21**
Dry matter	%	UNI EN 15414-3 : 2011	68.90	65.90	72.70	67.50	71.80	68.40	76.80	68.10	**70.01**	**3.53**
Moisture content	%	UNI EN 15414-3 : 2011	31.10	34.10	27.30	32.50	28.20	31.60	23.20	31.90	**29.99**	**3.53**
Ash	%	UNI EN 15403 : 2011	6.70	11.00	10.10	10.90	12.30	9.40	6.80	8.70	**9.49**	**2.01**
Bulk density	g/l	UNI EN 13040:2002	195.00	184.00	152.00	151.00	138.00	171.00	152.00	173.00	**164.50**	**19.35**
CV ar	KJ/Kg ar	UNI EN 15400:2011	12,098.00	12,422.00	12,707.00	12,519.00	11,972.00	13,109.00	15,263.00	12,179.00	**12,783.63**	**1,065.98**
CV dw	KJ/Kg dw	UNI EN 15400:2011	18,597.00	20,041.00	18,342.00	19,655.00	17,578.00	20,228.00	20,568.00	18,962.00	**19,246.38**	**1,042.84**
Carbon	mg/Kg dw	UNI EN 15407:2011	486,000.00	484,000.00	519,000.00	475,000.00	494,000.00	469,000.00	546,000.00	479,000.00	**494,000.00**	**25,922.96**
Hidrogen	mg/Kg dw	UNI EN 15407:2011	66,000.00	64,000.00	71,000.00	63,000.00	69,000.00	64,000.00	75,000.00	65,000.00	**67,125.00**	**4,189.70**
Nitrogen	mg/Kg dw	UNI EN 15407:2011	7,800.00	7,500.00	9,900.00	9,400.00	8,100.00	16,000.00	9,000.00	14,000.00	**10,212.50**	**3,110.09**
Fluorine	mg/Kg dw	EPA 5050 1994 + EPA 9056A 2007	40.00	60.00	80.00	60.00	60.00	90.00	50.00	60.00	**62.50**	**15.81**
Chlorine	mg/Kg dw	EPA 5050 1994 + EPA 9056A 2007	3,700.00	3,000.00	4,100.00	2,600.00	2,000.00	1,700.00	8,800.00	4,100.00	**3,750.00**	**2,232.87**
Sulfur	mg/Kg dw	EPA 5050 1994 + EPA 9056A 2007	1,437.00	1,669.00	2,338.00	1,481.00	1,170.00	804.00	768.00	1,395.00	**1,382.75**	**502.18**
Mercury	mg/Kg dw	EPA 3050 B 1996 + EPA 6010 C 2007	0.36	0.34	0.27	0.31	0.33	0.31	0.55	0.46	**0.37**	**0.09**
Cadmium	mg/Kg dw	EPA 3050 B 1996 + EPA 6010 C 2007	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	**0.70**	**0.00**
Antimony	mg/Kg dw	EPA 3050 B 1996 + EPA 6010 C 2007	8.00	7.60	3.20	6.10	7.90	3.70	3.80	6.20	**5.81**	**2.00**
Arsenic	mg/Kg dw	EPA 3050 B 1996 + EPA 6010 C 2007	1.40	1.80	1.40	1.00	1.20	1.70	1.10	1.30	**1.36**	**0.28**
Crhromium	mg/Kg dw	EPA 3050 B 1996 + EPA 6010 C 2007	26.10	29.20	75.50	78.60	24.40	43.10	83.40	89.20	**56.19**	**28.08**
Cobalt	mg/Kg dw	EPA 3050 B 1996 + EPA 6010 C 2007	1.40	1.70	2.10	1.40	1.00	1.10	1.30	2.20	**1.53**	**0.44**
Lead	mg/Kg dw	EPA 3050 B 1996 + EPA 6010 C 2007	18.80	23.10	37.80	23.60	14.70	16.00	66.10	19.20	**27.41**	**17.20**
Manganese	mg/Kg dw	EPA 3050 B 1996 + EPA 6010 C 2007	124.00	158.00	149.00	174.00	95.50	121.00	93.20	183.00	**137.21**	**34.09**
Nickel	mg/Kg dw	EPA 3050 B 1996 + EPA 6010 C 2007	14.30	14.10	16.00	12.40	11.20	7.70	11.40	26.30	**14.18**	**5.50**
Beryllium	mg/Kg dw	EPA 3050 B 1996 + EPA 6010 C 2007	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	**< 1**	
Selenium	mg/Kg dw	EPA 3050 B 1996 + EPA 6010 C 2007	< 2,1	< 2,1	< 2,1	< 2,1	< 2,1	< 2,1	< 2,1	< 2,1	**< 2,1**	
Particle size												
< 425 um	%	UNI 9903-4 :2004	0.55	0.98	0.47	0.52	0.51	0.98	0.56	0.56	**0.64**	**0.21**
< 850 um	%	UNI 9903-4 :2004	1.00	3.10	1.30	1.20	0.95	2.90	1.20	1.20	**1.61**	**0.87**
< 1,70 mm	%	UNI 9903-4 :2004	2.80	6.80	3.70	4.30	2.90	5.30	3.80	3.40	**4.13**	**1.34**
< 3,35 mm	%	UNI 9903-4 :2004	5.30	15.20	7.70	8.20	5.40	10.60	6.80	7.00	**8.28**	**3.26**
< 6,3 mm	%	UNI 9903-4 :2004	12.80	26.30	18.70	18.90	13.20	17.40	15.40	14.50	**17.15**	**4.37**
< 12,5 mm	%	UNI 9903-4 :2004	24.40	49.60	32.10	35.00	24.90	25.10	26.90	30.00	**31.00**	**8.42**
< 25 mm	%	UNI 9903-4 :2004	44.60	60.90	60.60	56.40	44.90	46.60	48.20	49.00	**51.40**	**6.84**
< 50 mm	%	UNI 9903-4 :2004	82.20	83.70	88.60	88.30	84.90	70.90	72.10	74.10	**80.60**	**7.20**
< 100 mm	%	UNI 9903-4 :2004	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	**100.00**	**-**

Annex 2 Lab Analyses

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ENTSORGAFIN SpA
S.P. per Castelnuovo Scrivia, 7
15057 TORTONA (AL)

Sampling Place: **MBT SIMBIO - Celje (Slovenia)**
Transport and Sampling: **Transport at room temperature, sampling performed under Customer Responsibility**

		Sample ID:	1226417-001
		Sampling Date:	06/11/12
		Arrival Date	12/11/2012
		Analysis from	12/11/2012
		to	16/11/2012
		Sample Name	SRF 1/10
		Type of Sample	Solid Recovered Fuel (SRF) from MBT process
Test	**Un.Mis.**	**Method**	**Result**
pH	unità pH	CNR IRSA 1 Q 64 Vol 3 1985	6,4
Residue at 105 °C	%	UNI EN 15414-3 : 2011	68,9
Moisture	%	UNI EN 15414-3 : 2011	31,1
Ash	%	UNI EN 15403 : 2011	6,7
Bulk Density	g/l	UNI EN 13040:2002	195
Lower Calorific Value - LCV	KJ/Kg dm	UNI EN 15400:2011	18597
Lower Calorific Value - LCV	KJ/Kg AR	UNI EN 15400:2011	12098
Carbon	mg/Kg dm	UNI EN 15407:2011	486000
Hydrogen	mg/Kg dm	UNI EN 15407:2011	66000
Nitrogen	mg/Kg dm	UNI EN 15407:2011	7800
Fluorine	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	< 40
Chlorine	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	3700
Sulfur	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	1437
Mercury	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	0,32
Cadmium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	0,34
Antimony	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	8,0
Arsenic	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	1,40
Chromium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	26,1
Cobalt	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	1,4
Lead	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	18,8
Manganese	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	124
Nickel	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	14,3
Beryllium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	< 1
Selenium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	< 2,1
Size:	%	UNI 9903-4 :2004	
< 425 um	%	UNI 9903-4 :2004	0,55
< 850 um	%	UNI 9903-4 :2004	1
< 1,70 mm	%	UNI 9903-4 :2004	2,8
< 3,35 mm	%	UNI 9903-4 :2004	5,3
< 6,3 mm	%	UNI 9903-4 :2004	12,8
< 12,5 mm	%	UNI 9903-4 :2004	24,4
< 25 mm	%	UNI 9903-4 :2004	44,6
< 50 mm	%	UNI 9903-4 :2004	82,2
< 100 mm	%	UNI 9903-4 :2004	100

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Sampling Place: **MBT SIMBIO - Celje (Slovenia)**
Transport and Sampling: **Transport at room temperature, sampling performed under Customer Responsibility**

		Sample ID:	1226417-002
		Sampling Date:	07/11/12
		Arrival Date	12/11/2012
		Analysis from	12/11/2012
		to	16/11/2012
		Sample Name	SRF 2/10
		Type of Sample	Solid Recovered Fuel (SRF) from MBT process
Test	**Un.Mis.**	**Method**	**Result**
pH	unità pH	CNR IRSA 1 Q 64 Vol 3 1985	6,4
Residue at 105 °C	%	UNI EN 15414-3 : 2011	65,9
Moisture	%	UNI EN 15414-3 : 2011	34,1
Ash	%	UNI EN 15403 : 2011	11,0
Bulk Density	g/l	UNI EN 13040:2002	184
Lower Calorific Value - LCV	KJ/Kg dm	UNI EN 15400:2011	20041
Lower Calorific Value - LCV	KJ/Kg AR	UNI EN 15400:2011	12422
Carbon	mg/Kg dm	UNI EN 15407:2011	484000
Hydrogen	mg/Kg dm	UNI EN 15407:2011	64000
Nitrogen	mg/Kg dm	UNI EN 15407:2011	7500
Fluorine	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	< 60
Chlorine	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	3000
Sulfur	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	1669
Mercury	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	0,34
Cadmium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	0,53
Antimony	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	7,6
Arsenic	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	1,80
Chromium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	29,2
Cobalt	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	1,7
Lead	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	23,1
Manganese	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	158
Nickel	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	14,1
Beryllium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	< 1
Selenium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	< 2,1
Size:	%	UNI 9903-4 :2004	
< 425 um	%	UNI 9903-4 :2004	0,98
< 850 um	%	UNI 9903-4 :2004	3,1
< 1,70 mm	%	UNI 9903-4 :2004	6,8
< 3,35 mm	%	UNI 9903-4 :2004	15,2
< 6,3 mm	%	UNI 9903-4 :2004	26,3
< 12,5 mm	%	UNI 9903-4 :2004	49,6
< 25 mm	%	UNI 9903-4 :2004	60,9
< 50 mm	%	UNI 9903-4 :2004	83,7
< 100 mm	%	UNI 9903-4 :2004	100

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15057 TORTONA (AL)

Sampling Place: MBT SIMBIO - Celje (Slovenia)
Transport and Sampling: Transport at room temperature, sampling performed under Customer Responsibility

		Sample ID:	1226417-003
		Sampling Date:	05/11/12
		Arrival Date	12/11/2012
		Analysis from	12/11/2012
		to	16/11/2012
		Sample Name	SRF 3/10
		Type of Sample	Solid Recovered Fuel (SRF) from MBT process
Test	**Un.Mis.**	**Method**	**Result**
pH	unità pH	CNR IRSA 1 Q 64 Vol 3 1985	6,4
Residue at 105 °C	%	UNI EN 15414-3 : 2011	72,7
Moisture	%	UNI EN 15414-3 : 2011	27,3
Ash	%	UNI EN 15403 : 2011	10,1
Bulk Density	g/l	UNI EN 13040:2002	152
Lower Calorific Value - LCV	Kj/Kg dm	UNI EN 15400:2011	18342
Lower Calorific Value - LCV	Kj/Kg AR	UNI EN 15400:2011	12707
Carbon	mg/Kg dm	UNI EN 15407:2011	519000
Hydrogen	mg/Kg dm	UNI EN 15407:2011	71000
Nitrogen	mg/Kg dm	UNI EN 15407:2011	9900
Fluorine	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	80
Chlorine	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	4100
Sulfur	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	2338
Mercury	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	0,27
Cadmium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	0,35
Antimony	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	3,2
Arsenic	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	1,40
Chromium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	75,5
Cobalt	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	2,1
Lead	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	37,8
Manganese	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	149
Nickel	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	16,0
Beryllium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	< 1
Selenium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	< 2,1
Size:	%	UNI 9903-4 :2004	
< 425 um	%	UNI 9903-4 :2004	0,47
< 850 um	%	UNI 9903-4 :2004	1,3
< 1,70 mm	%	UNI 9903-4 :2004	3,7
< 3,35 mm	%	UNI 9903-4 :2004	7,7
< 6,3 mm	%	UNI 9903-4 :2004	18,7
< 12,5 mm	%	UNI 9903-4 :2004	32,1
< 25 mm	%	UNI 9903-4 :2004	60,6
< 50 mm	%	UNI 9903-4 :2004	88,6
< 100 mm	%	UNI 9903-4 :2004	100

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Sampling Place: MBT SIMBIO - Celje (Slovenia)
Transport and Sampling: Transport at room temperature, sampling performed under Customer Responsibility

Sample ID:	1226417-004
Sampling Date:	31/10/12
Arrival Date	12/11/2012
Analysis from	12/11/2012
to	16/11/2012
Sample Name	SRF 4/10
Type of Sample	Solid Recovered Fuel (SRF) from MBT process

Test	Un.Mis.	Method	Result
pH	unità pH	CNR IRSA 1 Q 64 Vol 3 1985	6,4
Residue at 105 °C	%	UNI EN 15414-3 : 2011	67,5
Moisture	%	UNI EN 15414-3 : 2011	32,5
Ash	%	UNI EN 15403 : 2011	10,9
Bulk Density	g/l	UNI EN 13040:2002	151
Lower Calorific Value - LCV	KJ/Kg dm	UNI EN 15400:2011	19655
Lower Calorific Value - LCV	KJ/Kg AR	UNI EN 15400:2011	12519
Carbon	mg/Kg dm	UNI EN 15407:2011	475000
Hydrogen	mg/Kg dm	UNI EN 15407:2011	63000
Nitrogen	mg/Kg dm	UNI EN 15407:2011	9400
Fluorine	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	< 60
Chlorine	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	2600
Sulfur	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	1481
Mercury	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	0,31
Cadmium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	0,41
Antimony	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	6,1
Arsenic	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	1,00
Chromium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	78,6
Cobalt	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	1,4
Lead	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	23,6
Manganese	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	174
Nickel	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	12,4
Beryllium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	< 1
Selenium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	< 2,1
Size:	%	UNI 9903-4 :2004	
< 425 um	%	UNI 9903-4 :2004	0,52
< 850 um	%	UNI 9903-4 :2004	1,2
< 1,70 mm	%	UNI 9903-4 :2004	4,3
< 3,35 mm	%	UNI 9903-4 :2004	8,2
< 6,3 mm	%	UNI 9903-4 :2004	18,9
< 12,5 mm	%	UNI 9903-4 :2004	35
< 25 mm	%	UNI 9903-4 :2004	56,4
< 50 mm	%	UNI 9903-4 :2004	88,3
< 100 mm	%	UNI 9903-4 :2004	100

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Sampling Place: MBT SIMBIO - Celje (Slovenia)
Transport and Sampling: Transport at room temperature, sampling performed under Customer Responsibility

		Sample ID:	1226417-005
		Sampling Date:	30/10/12
		Arrival Date	12/11/2012
		Analysis from	12/11/2012
		to	16/11/2012
		Sample Name	SRF 5/10
		Type of Sample	Solid Recovered Fuel (SRF) from MBT process
Test	**Un.Mis.**	**Method**	**Result**
pH	unità pH	CNR IRSA 1 Q 64 Vol 3 1985	6,2
Residue at 105 °C	%	UNI EN 15414-3 : 2011	71,8
Moisture	%	UNI EN 15414-3 : 2011	28,2
Ash	%	UNI EN 15403 : 2011	12,3
Bulk Density	g/l	UNI EN 13040:2002	138
Lower Calorific Value - LCV	KJ/Kg dm	UNI EN 15400:2011	17578
Lower Calorific Value - LCV	KJ/Kg AR	UNI EN 15400:2011	11972
Carbon	mg/Kg dm	UNI EN 15407:2011	494000
Hydrogen	mg/Kg dm	UNI EN 15407:2011	69000
Nitrogen	mg/Kg dm	UNI EN 15407:2011	8100
Fluorine	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	< 60
Chlorine	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	2000
Sulfur	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	1170
Mercury	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	0,33
Cadmium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	0,3
Antimony	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	7,9
Arsenic	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	1,20
Chromium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	24,4
Cobalt	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	< 1
Lead	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	14,7
Manganese	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	95,5
Nickel	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	11,2
Beryllium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	< 1
Selenium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	< 2,1
Size:	%	UNI 9903-4 :2004	
< 425 um	%	UNI 9903-4 :2004	0,51
< 850 um	%	UNI 9903-4 :2004	0,95
< 1,70 mm	%	UNI 9903-4 :2004	2,9
< 3,35 mm	%	UNI 9903-4 :2004	5,4
< 6,3 mm	%	UNI 9903-4 :2004	13,2
< 12,5 mm	%	UNI 9903-4 :2004	24,9
< 25 mm	%	UNI 9903-4 :2004	44,9
< 50 mm	%	UNI 9903-4 :2004	84,9
< 100 mm	%	UNI 9903-4 :2004	100

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Sampling Place: MBT SIMBIO - Celje (Slovenia)
Transport and Sampling: Transport at room temperature, sampling performed under Customer Responsibility

Sample ID:	1226417-006
Sampling Date:	02/11/12
Arrival Date	12/11/2012
Analysis from	12/11/2012
to	16/11/2012
Sample Name	SRF 6/10
Type of Sample	Solid Recovered Fuel (SRF) from MBT process

Test	Un.Mis.	Method	Result
pH	unità pH	CNR IRSA 1 Q 64 Vol 3 1985	6,2
Residue at 105 °C	%	UNI EN 15414-3 : 2011	68,4
Moisture	%	UNI EN 15414-3 : 2011	31,6
Ash	%	UNI EN 15403 : 2011	9,4
Bulk Density	g/l	UNI EN 13040:2002	171
Lower Calorific Value - LCV	Kj/Kg dm	UNI EN 15400:2011	20228
Lower Calorific Value - LCV	Kj/Kg AR	UNI EN 15400:2011	13109
Carbon	mg/Kg dm	UNI EN 15407:2011	469000
Hydrogen	mg/Kg dm	UNI EN 15407:2011	64000
Nitrogen	mg/Kg dm	UNI EN 15407:2011	16000
Fluorine	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	90
Chlorine	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	1700
Sulfur	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	804
Mercury	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	0,31
Cadmium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	0,29
Antimony	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	3,7
Arsenic	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	1,70
Chromium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	43,1
Cobalt	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	1,1
Lead	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	16
Manganese	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	121
Nickel	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	7,7
Beryllium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	< 1
Selenium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	< 2,1
Size:	%	UNI 9903-4 :2004	
< 425 um	%	UNI 9903-4 :2004	0,98
< 850 um	%	UNI 9903-4 :2004	2,9
< 1,70 mm	%	UNI 9903-4 :2004	5,3
< 3,35 mm	%	UNI 9903-4 :2004	10,6
< 6,3 mm	%	UNI 9903-4 :2004	17,4
< 12,5 mm	%	UNI 9903-4 :2004	25,1
< 25 mm	%	UNI 9903-4 :2004	46,6
< 50 mm	%	UNI 9903-4 :2004	70,9
< 100 mm	%	UNI 9903-4 :2004	100

Uncertainty = expanded uncertainty associated with a confidence level of 95%
u.m. = Unit measure
This test report relates only to the sample tested. This report can not be reproduced without the written permission of the Head of the laboratory Lab Analysis.

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Assistenza Tecnica
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ORDINE DEI CHIMICI DELLA PROVINCIA DI PAVIA
Dott. MAGGI LORENZO CHIMICO
N°445A

lab Analysis s.r.l.

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ENTSORGAFIN SpA
S.P. per Castelnuovo Scrivia, 7
15057 TORTONA (AL)

Sampling Place: **MBT SIMBIO - Celje (Slovenia)**
Transport and Sampling: **Transport at room temperature, sampling performed under Customer Responsibility**

Sample ID:	1226417-007
Sampling Date:	03/11/12
Arrival Date	12/11/2012
Analysis from	12/11/2012
to	16/11/2012
Sample Name	SRF 7/10
Type of Sample	Solid Recovered Fuel (SRF) from MBT process

Test	Un.Mis.	Method	Result
pH	unità pH	CNR IRSA 1 Q 64 Vol 3 1985	5,8
Residue at 105 °C	%	UNI EN 15414-3 : 2011	76,8
Moisture	%	UNI EN 15414-3 : 2011	23,2
Ash	%	UNI EN 15403 : 2011	6,8
Bulk Density	g/l	UNI EN 13040:2002	152
Lower Calorific Value - LCV	KJ/Kg dm	UNI EN 15400:2011	20568
Lower Calorific Value - LCV	KJ/Kg AR	UNI EN 15400:2011	15263
Carbon	mg/Kg dm	UNI EN 15407:2011	546000
Hydrogen	mg/Kg dm	UNI EN 15407:2011	75000
Nitrogen	mg/Kg dm	UNI EN 15407:2011	9000
Fluorine	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	< 50
Chlorine	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	8800
Sulfur	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	768
Mercury	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	0,55
Cadmium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	0,27
Antimony	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	3,8
Arsenic	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	1,10
Chromium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	83,4
Cobalt	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	1,3
Lead	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	66,1
Manganese	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	93,2
Nickel	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	11,4
Beryllium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	< 1
Selenium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	< 2,1
Size:	%	UNI 9903-4 :2004	
< 425 um	%	UNI 9903-4 :2004	0,56
< 850 um	%	UNI 9903-4 :2004	1,2
< 1,70 mm	%	UNI 9903-4 :2004	3,8
< 3,35 mm	%	UNI 9903-4 :2004	6,8
< 6,3 mm	%	UNI 9903-4 :2004	15,4
< 12,5 mm	%	UNI 9903-4 :2004	26,9
< 25 mm	%	UNI 9903-4 :2004	48,2
< 50 mm	%	UNI 9903-4 :2004	72,1
< 100 mm	%	UNI 9903-4 :2004	100

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ENTSORGAFIN SpA
S.P. per Castelnuovo Scrivia, 7
15057 TORTONA (AL)

Sampling Place: MBT SIMBIO - Celje (Slovenia)
Transport and Sampling: Transport at room temperature, sampling performed under Customer Responsibility

Sample ID:	1226417-008
Sampling Date:	29/10/12
Arrival Date	12/11/2012
Analysis from	12/11/2012
to	16/11/2012
Sample Name	SRF 8/10
Type of Sample	Solid Recovered Fuel (SRF) from MBT process

Test	Un.Mis.	Method	Result
pH	unità pH	CNR IRSA 1 Q 64 Vol 3 1985	6,3
Residue at 105 °C	%	UNI EN 15414-3 : 2011	68,1
Moisture	%	UNI EN 15414-3 : 2011	31,9
Ash	%	UNI EN 15403 : 2011	8,7
Bulk Density	g/l	UNI EN 13040:2002	173
Lower Calorific Value - LCV	Kj/Kg dm	UNI EN 15400:2011	18962
Lower Calorific Value - LCV	Kj/Kg AR	UNI EN 15400:2011	12179
Carbon	mg/Kg dm	UNI EN 15407:2011	479000
Hydrogen	mg/Kg dm	UNI EN 15407:2011	65000
Nitrogen	mg/Kg dm	UNI EN 15407:2011	14000
Fluorine	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	< 60
Chlorine	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	4100
Sulfur	mg/Kg dm	EPA 5050 1994 + EPA 9056A 2007	1395
Mercury	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	0,46
Cadmium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	0,41
Antimony	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	6,2
Arsenic	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	1,30
Chromium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	89,2
Cobalt	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	2,2
Lead	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	19,2
Manganese	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	183
Nickel	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	26,3
Beryllium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	< 1
Selenium	mg/Kg dm	EPA 3050 B 1996 + EPA 6010 C 2007	< 2,1
Size:	%	UNI 9903-4 :2004	
< 425 um	%	UNI 9903-4 :2004	0,56
< 850 um	%	UNI 9903-4 :2004	1,2
< 1,70 mm	%	UNI 9903-4 :2004	3,4
< 3,35 mm	%	UNI 9903-4 :2004	7
< 6,3 mm	%	UNI 9903-4 :2004	14,5
< 12,5 mm	%	UNI 9903-4 :2004	30
< 25 mm	%	UNI 9903-4 :2004	49
< 50 mm	%	UNI 9903-4 :2004	74,1
< 100 mm	%	UNI 9903-4 :2004	100

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N°445A

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Rev.	Date	Description	Written	Checked	Approved
0	12/Feb/2013	First emission	SMACI	UTC	PCM
A	12/Feb/2013	revision	JB	UTC	PCM
B	18/Feb/2013	revision	SMACI	UTC	PCM

SUMMARY

1. Introduction

In order to provide USEPA with additional information to clarify that the proposed process is unique to Entsorga, we are willing to disclose part of confidential our matter by including detailed description of equipment's constitution and functioning, as well as ranges of possible equipment settings and achievable efficiency rates.

2. Description of mechanical pre-treatment equipment

2.1. 1st Screening Trommel

From the reception pit, waste is moved by the bridge crane into the hopper of a mechanical bag-breaking and screening device.

By rotating, the drum opens the bags and splits the incoming waste into two streams, an oversize fraction ("Overscreen", like non recyclables plastic films, logs, wood, cardboards, textiles and carpets) and an undersize fraction ("Underscreen"). The screening mesh size can vary between 80 and 250 mm depending on waste characteristics. Once separated, the Overscreen is transported by a conveyor to a primary shredder and then to the refining section. This fraction is typically expected to be between 10% and 20% of the incoming waste.

The remaining undersize materials is homogenized, in order to create the optimal conditions of density and porosity, and conveyed into the underscreen pit of the bioxidation hall for further processing.

3. Description of mechanical treatment-refinement equipment

3.1. Overscreen Primary Shredder

The overscreen material coming from the pre-treatment section, mainly composed by large items, is unloaded into a primary shredder where it is properly dimensioned (< 350 mm) and then discharged into the hopper of the SRF refining line where it is mixed with the bio-dried material. This is a single-shaft stationary shredder that features PLC-controlled automatic reversal and shredding in both directions. It is able to shred several heavy duty materials including carpets, mattresses and other difficult materials, as well as wood and household waste.

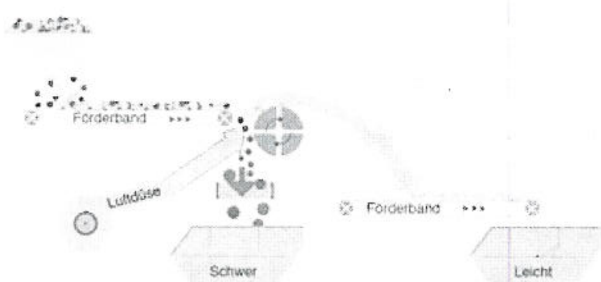
3.2. 2nd Screening Trommel

The material stabilized in the bio-drying section is unloaded by the crane into the hopper of the SRF refinement line and mixed with shredded overscreen. The following screening phase separates the fines (< 20-50 mm depending on material characteristics and product requirements) and removes them from the material stream. This operation allows the removal of most of the small-sized particles and dusts, which can contain significant pollutants such as heavy metals, thus increasing the final product quality and safety. The screening is performed by a fast rotary trommel (up to 20 rpm), fed by an input cylinder made of steel plates and connected with a driving ring. The main drum frame consists of head beams covered with wear-resistant exchangeable steel plates. The plates are characterized by numerous round holes, which act as a screen and let pass through the unwanted material below a specific size. The material remaining inside the drum is the desired final product which is discharged on a conveyor and transported to the following equipment.

3.3. Air Classification

The air classifier splits the material stream into a low density and high density fraction. The low density stream contains mainly plastic, paper, card and organics, collectively having a higher calorific value and is the source of the high quality SRF.

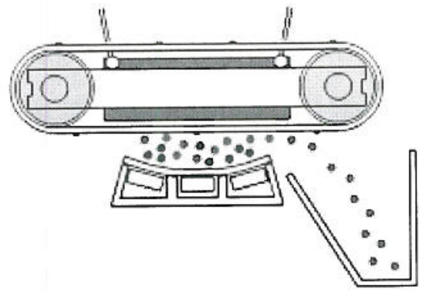
The high density stream generates SRF or waste depending upon the SRF specification. This step can be calibrated by fine tuning the equipment efficiency in order to obtain the SRF under the required specification. Materials are separated using a process made up of three basic components - the acceleration belt, the air nozzle and the separation drum. The material is accelerated on a feeding belt to a suitable speed and transported to the discharge edge. The material falling from above meets an upward flow generated by an adjustable air nozzle attached below the feed belt. The air stream meets the upper area of the rotation drum and is fed into the expansion chamber with the laminar flow. The material meets the air stream and is separated into light and heavy material. The light materials are transported via an air stream at higher speed into the expansion chamber where the air speed is radically reduced so that the light materials end up on a discharge conveyor. The heavy materials fall downward before the rotation drum into a container or onto a discharge conveyor.



3.4. Iron and other Fe-metals removal

After air classification, in order to increase SRF quality and material recycling, ferrous metals are removed from the material stream by magnets operating on both the light and heavy streams, with a separation efficiency > 95%. The removal is carried out by permanent magnetic separators, which, depending on the need, can be arranged transversely or longitudinally above the conveyors. The iron, which is attracted upwards, i.e. towards the magnetic plate placed inside the machine, remains attached to the separator belt which, by turning continuously, unload the separated material in special channels or collection containers.

Afterwards, separated metals are marketed and delivered to Material Recovery Facilities where they will be recycled and valorised.

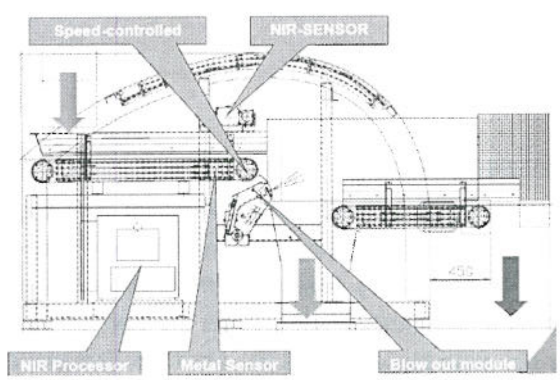


3.5. *NIR (Near Infra Red) PVC removal*

In order to increase SRF quality and to minimize the environmental impact of its combustion, an optical sorting machine is installed for the separation of PVC plastic materials (polyvinyl chloride). The NIR separator is an optical sorting machine which efficiently separates individual unwanted plastics found in the material stream. The system uses high-precision particle detection sensors which identifies the objects at the correct positions, whereupon precise ejection pulses from compressed-air nozzles blow the recognized objects out of the material stream. This sorting system makes use of the materials' property by absorbing characteristic wavelengths. These absorbed wavelengths are determined by the specific material's molecular structure. They lie above the region of visible light, in the infrared region of the spectrum. Hyperspectral imaging technology enables the high-resolution spectrometer to carry out extremely fast material recognition. The unit analyzes the radiation reflected from the material to be sorted according to its task and can thus selectively separate PVC plastics, as well as other materials if needed. This technology is commercial and is successfully operating in several installations around the world.

By achieving high levels of PVC removal efficiencies, this system strongly contributes to minimizing the levels of chlorine in the air emission profiles of the SRF users.

Near Infrared (NIR) - SYSTEM

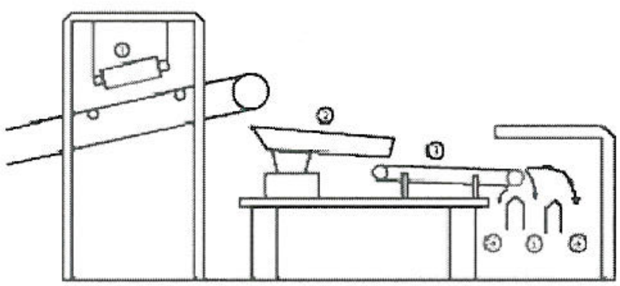


3.6. SRF shredding

After removal of fines, Fe-metals and PVC plastics, the SRF is then shredded to achieve a specific final particle size and shape according to the final user requirements. For specific users and applications different particle dimensions may be required (2D: from 30x30mm to 100x100mm; 3D: from 10x10x10mm to 100x100x10mm). In most of the cases the final user will opt for a 2D spatial configuration with 35x35 mm dimensions in the form of fluff as it is intended to be pneumatically fed to the burners. The equipment is composed by a single shaft shredder, with a throughput capacity up to 20 t/h, especially suited for the secondary size reduction/granulation of pre-shredded material (free of large extraneous parts).

3.7. Non-Fe metals removal

After Fe-metal removal and secondary shredding, an eddy current separator is placed on the high quality SRF line to divert residual non-ferrous metals (with a separation efficiency > 95%), further enhancing both the quality of SRF and materials recycling rate. This separator is based on the principle of eddy currents (Foucault currents) generated by a rotating magnetic field. The induced currents circulating in the non-ferrous metals to be separated create such a repulsion force that cause their expulsion from the material flow. In particular, after Fe-metals removal (1), the material is discharged onto a vibrating feeder (2) which broadens and doses the flow. The conveyor belt of the eddy current separator (3) has variable speed as well as the magnetic rotor (inducer). The residual ferrous materials are discharged into a first hopper (4), the inert residues fall into a central hopper (5), the non-ferrous metals are released and discharged into a final hopper (6).



3.8. Compaction and storage

Depending on final destination, SRF can be either stored as a fluff in a covered area near the refining section, or compacted within a container press or a press baler, or wrapped. In case of close proximity of the final user facility, SRF can be directly transported to the burner's feeding system by conveyors. According to customers requirements the SRF can be also pelletized, however in most of the cases, the fluff form is preferred by the final users, since it makes SRF to be easily fed to the dedicated burners by means of pneumatic conveying systems.